

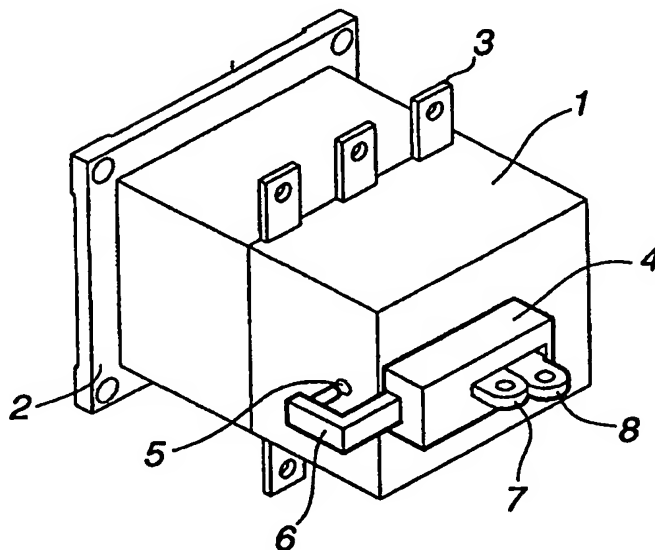
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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup>:</b> <b>H01H 50/32</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 99/56295</b> <b>(43) International Publication Date:</b> 4 November 1999 (04.11.99)
<b>(21) International Application Number:</b> PCT/SE99/00712 <b>(22) International Filing Date:</b> 29 April 1999 (29.04.99) <b>(30) Priority Data:</b> 9801499-6 29 April 1998 (29.04.98) SE <b>(71) Applicant (for all designated States except US):</b> ABB AB [SE/SE]; S-721 83 Västerås (SE). <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> ALMQUIST, Bengt [SE/SE]; Pionvägen 35, S-722 46 Västerås (SE). KJELLNÄS, Stefan [SE/SE]; Forellgatan 16, S-723 49 Västerås (SE). KLEMMESTAD, Åsmund [NO/SE]; Rösegårdsgatan 88, S-724 76 Västerås (SE). <b>(74) Agents:</b> LUNDBLAD VANNESJÖ, Katarina et al.; ABB AB, Patent, S-721 78 Västerås (SE).		<b>(81) Designated States:</b> AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> With international search report.

**(54) Title:** RELAY**(57) Abstract**

An industrial relay comprising a relay cover (1) and an armature moveable between an open position and a closed position which further comprises a locking means (4). The locking means (4) is arranged on the front of the relay cover for co-operation with the armature of the relay in the open contacts position such that the armature is lockable in the open contacts position.



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5    Relay

## TECHNICAL FIELD

10    The invention concerns the technical field of low voltage  
switchgear and control gear for industrial use. In particular  
it concerns mechanical contactors, sometimes described and in  
the following called relays, used for switching on and off  
electrical equipment such as electric motors.

## 15    BACKGROUND ART

It is common practice to use relays to switch industrial  
electrical equipment on and off. One such series of relays is  
illustrated in a brochure from ABB Control called CONTACTORS.  
20    A range of relays is illustrated including models for use with  
electric motors ranging in power from 2.2 kW at 220V AC up to  
315V at 1000V AC.

The safe operation of electrical equipment requires that the  
25    equipment can be made mechanically safe and electrically safe.

A requirement that arises with electrical equipment is that it  
may be secured in the off position. This is required for  
example for maintenance access to equipment. In many instances  
30    it can be damaging to equipment or dangerous for operators if  
the equipment were to be switched on before the maintenance  
were complete. Isolators which isolate the equipment from an  
electrical supply or circuit breakers are frequently used for  
this purpose. A circuit breaker may for example be set in the  
35    open position and a lever on the outside of the case locked in  
the open position with a padlock. However there is often only

one circuit breaker in each power circuit but more than one. separately operated piece of electrical equipment connected to that circuit. Thus a requirement exists to isolate one item of independently switched equipment safely without isolating  
5 other equipment connected to a power circuit.

This area is covered in an international standard IEC 947-1 (1996-09) and Amendment 1, 60947-1, (1997-12) which is entitled Low voltage switchgear and control gear. In this  
10 standard, the additional constructional requirements for equipment for isolation are specified under sections 7.1.6. in the standard and the amendment. The requirements include that "Indication of the position of the main contacts shall be provided" and that "When means are provided or specified by  
15 the manufacturer to lock the equipment in the open position, locking in that position shall only be possible when the main contacts are in the open position".

US 3745492 describes an electromagnetic contactor. A  
20 mechanical latch mechanism 16 is also described, fitted to a sideways-extending part of the baseboard on one side of the contactor. This latch may be locked in a locking position with a padlock. The latch includes seven metal parts, one slide member 168, two of coil springs 186, two of retaining pins  
25 188, and two upright supports 170, 172 assembled together, fastened together by, for example, spot-welding, which latch assembly is then screwed or riveted to the baseboard. Latch mechanism 16 does not include a means for electrical disconnection of the coil excitation current.

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#### SUMMARY OF THE INVENTION

The object of the invention is to provide an improved mechanical contactor or relay that also functions as an

electrical isolator in a way that satisfies recognised standards.

This and other objects are satisfied according to the invention by arranging a locking means on the front of the relay cover for co-operation with the armature in the open contacts position such that the armature is lockable in the open position. When the contacts are in the open position, the locking means is moveable into a locked position. In the locked position, the locking means mechanically locks the armature inside the relay in the open position (off position) so that the relay cannot be moved to the closed position (on position). The locking means is secured in the locked position with a lock. The locking means can only be moved into the locked position when the main contacts are in the open position.

In a development of the invention the locking means includes a electrical switch that disconnects the coil excitation current when the locking means is in the locked position. A further embodiment of the locking means prevents the relay from being moved to the closed position by co-operating with the magnets.

The advantages of the invention include that it may be used as a substitute for a separate isolating device in some applications. The invention thus economically serves as both a relay and an isolator in some applications. The relay is very compact and requires a minimum of space for mounting it. When a relay is locked according to the invention that condition is visibly and unambiguously indicated on the front of the relay cover. Even when a row of similar relays are mounted side by side, it is obvious which relay is locked by a padlock cooperating with a locking means according to the present invention. The invention is also economic to manufacture and simple to use and contributes to the safe use of equipment.

## A SHORT DESCRIPTION OF THE DRAWINGS

Figure 1 shows schematically an external view of a relay with a locking means according to the invention.

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Figure 2 shows a view of parts of a relay with locking means according to the invention.

Figure 3 shows a external view of a relay with a locking means according to the invention.

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Figure 4 shows an external view of a relay with another embodiment of the locking means according to the invention.

Figure 5 shows a view of parts of a relay with a another embodiment of the locking means according to the invention.

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## DESCRIPTION OF THE PREFERRED EMBODIMENTS

A relay of the contactor type according to common practice consists of moveable contacts arranged on an armature, fixed contacts, a coil and magnets. The armature moves from an open position to a closed position. Such a relay is normally arranged with one resting position only, which is in the open position. Relays are usually mounted on a backplate 2, normally enclosed in a cover 1 with only the end of the armature and the connection pieces 3 visible from the outside, as shown in Figures 1, 4.

20

The invention comprises a locking means 4 with a first locking device, for example a sliding pin or a moving rod 6 which is arranged on the outside of the front of the relay cover 1 in a plane substantially parallel with backplate 2. A second locking device such as a recess or passageway 11 is arranged on the armature 10 as shown in Figure 2. The first locking

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device is arranged in the locking means 4 on the front of relay cover 1 such that it can co-operate with the recess in the armature and lock the armature when it is in the open position. The locking means 4 is arranged with tags 7, 8 comprising passageways such that a lock or a padlock 9 is used to secure the relay in the locked position. When the armature is locked in the open position the contacts cannot be switched from the open to the closed position. Thus, only persons having a key to the lock are able to unlock the relay and switch on the machine.

The armature 10 shown in Figure 2 is arranged with second locking device such as a recess 11 positioned adjacent to an passageway 5 in the relay cover 1. A locking means 4 comprising a first locking device such a moveable pin 6, is arranged on the outside of the front of the relay cover 1. The locking means includes a tag or eye 7 arranged with a passageway. When the locking means 4 is moved to a locked position, the eye 7 co-operates with a second eye 8 or other passageway fastened to the locking means 4, through which a lock or a padlock 9 is attached as shown in Figure 3.

When the relay is locked with the locking means 4, the position of the armature is indicated by the locked position of the locking means on the front of the relay cover 1.

In an advantageous development of the invention the locking means 4 comprises an electrical switch. The electrical switch is arranged such that the coil excitation current is disconnected from the coil when the locking means is in the locked position.

In another embodiment of the invention the armature protrudes through the front of the relay cover, as shown in Figure 4.

The protruding part 12 of the armature has a second locking

device such as a passageway or recess 11a. A locking means 6a is arranged on the front of the relay cover 1 to co-operate with the recess 11a in the armature, as shown in Figure 4.

- 5 A further embodiment of the locking means shown in Figure 5 has a first locking device 6b which is moveable through a passageway in the relay cover (not shown) to where it is placed between the magnets 13 and the coil 14. In this way the armature is prevented from moving from the open to the closed
- 10 position. In this embodiment the first locking device 6b is sized in relation to the distance between the magnets 13 and the coil 14 so that no significant movement of the armature is possible when the locking device 6b is inserted. The first locking device is also made from a non-conductive material
- 15 and/or suitably insulated and enclosed.



## Claims

1. An industrial relay comprising a relay cover (1), a locking means (4) and an armature moveable between an open position  
5 and a closed position, **characterised** in that the locking means (4) is arranged on the front of the relay cover (1) for co-operation with the armature of the relay in the open contacts position such that the armature is lockable in the open contacts position.
- 10 2. An industrial relay according to claim 1, **characterised** in that said locking means (4) comprises a first locking device (6, 6a, 6b) and a second locking device (11, 11a).
- 15 3. An industrial relay according to claim 1, **characterised** in that said first locking device (6, 6a, 6b) is attached moveable to said locking means (4).
- 20 4. An industrial relay according to claim 2, **characterised** in that said second locking device is provided with a recess (11, 11a) in the armature for receiving said first locking device (6, 6a, 6b) through a passageway in the relay cover (1).
- 25 5. An industrial relay according to claim 1, **characterised** in that said locking means comprises a switch that disconnects the excitation current from the coil when said locking means (4) is in the locked position.
- 30 6. An industrial relay according to any of the claims 1 to 5, **characterised** in that said locking means comprises one or more passageways (7, 8) for receiving a padlock (9) when the locking means is in the locked position so preventing the relay from being switched on without the use of a key.

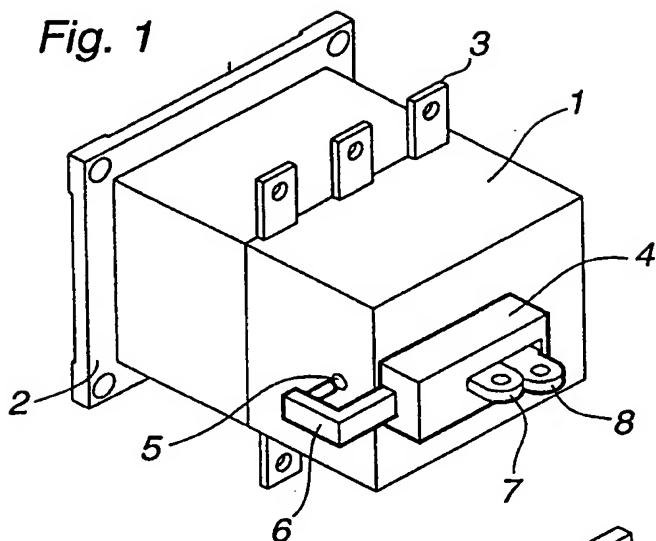
7. An industrial relay according to claim 1, **characterised** in that said locking means can only be operated and locked in the open contacts position.

- 5 8. A method for indicating the position of the main contacts of an industrial relay comprising an armature, fixed contacts and moveable contacts, **characterised** by the steps of
- providing the relay with a locking means (4) on the outside of the front of relay cover (1),
  - 10 - locking the armature with the contacts in the open position using said locking means (4),
  - securing said locking means (4) in the locked position with a lock or padlock (9) attached via one or more passageways (7, 8) in said locking means (4) showing that
  - 15 said armature is in the open position.

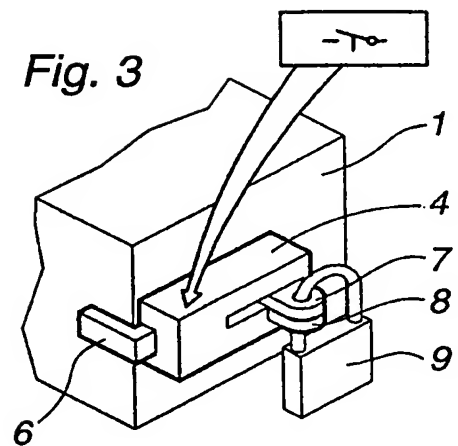
9. A method for isolating an electrical apparatus connected to an electrical supply by an industrial relay comprising an armature, fixed contacts and moveable contacts, **characterised**
- 20 by the steps of
- providing the relay with a locking means (4) on the outside of the front of relay cover (1),
  - locking the armature with the contacts in the open position using said locking means (4),
  - 25 - securing said locking means (4) in the locked position with a lock or padlock (9) attached via one or more passageways (7, 8) in said locking means (4).

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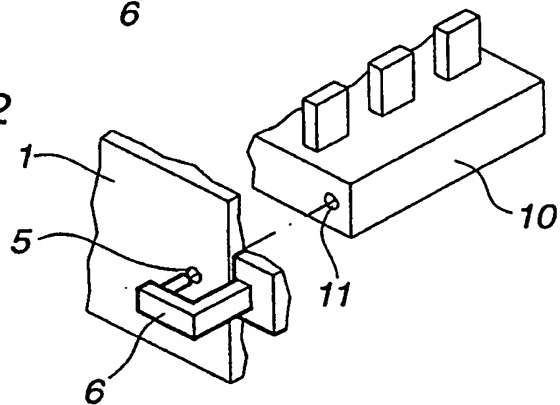
*Fig. 1*



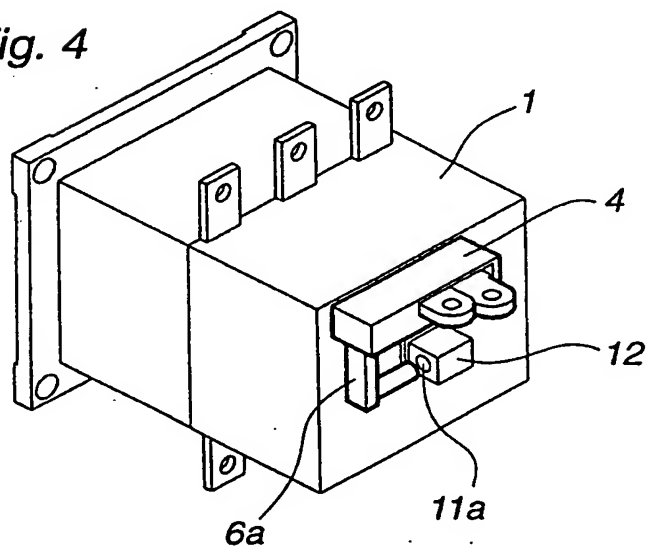
**Fig. 3**



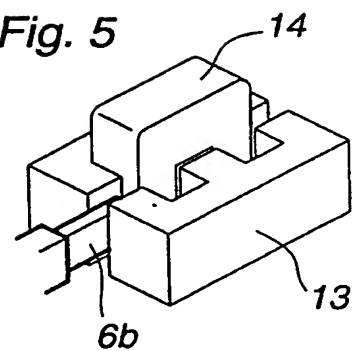
*Fig. 2*



**Fig. 4**



**Fig. 5**



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 99/00712

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H01H 50/32

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H01H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3745492 A (KURT A. GRUNERT), 10 July 1973 (10.07.73), column 5, line 30 - column 6, line 15, figures 1,2  -- -----	1-9

☐ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

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US 3745492 A	10/07/73	NONE	